Intelligent License Plate Recognition
for Security Applications
Introduction

Automated number plate recognition systems (ANPR) are widely used by law enforcement agencies worldwide. For the most part these systems require the use of specialized cameras connected to digital signal processing devices that perform optical character recognition (OCR) of the license plate. The localization of the license plate (where in the picture is the license plate to be recognized) has historically been an issue for ANPRs. To get around this issue, it has been required that cameras be positioned such that license plates appear consistently in the same area of the image. The output of the OCR process is then forwarded to specialized software that manages the information and links to other databases. The more successful systems require the use of video cameras that work both in the infrared spectrum as well as the color spectrum. The OCR analysis is often finely tuned to the type of license plate that is to be recognized. License plates vary from country to country, state to state, and often over time as well, so there is no general purpose license plate recognition system that will work equally well across a spectrum of plate types without significant re-training for each.

In order to facilitate automated license plate recognition, several countries and municipalities have modified license plate designs and introduced, for example, reflective coatings so that the numbers may be recognized over a wider range of environmental situations. If all of these factors are in place (training for a specific type of plate, reflective surfaces, etc.) then today's systems routinely achieve recognition rates that are well in excess of 90% accuracy. However if the actual conditions differ, it is not uncommon to hear of recognition rates that are much lower (as
low as a factor of two reduction in accuracy).

In essence, in order to achieve acceptable performance, automated license plate recognition systems have evolved as very specialized, single purpose systems that require a dedicated investment in hardware and software that cannot be used for anything else. Further, these systems/solutions are targeted to a specific geographic markets and cannot generally be transferred from country to country or locality to locality without the potential for additional re-work/re-training, etc.

The current situation makes it difficult for commercial/retail enterprises to leverage the benefits of automated license plate recognition, and be able to do so economically and with a high return on investment rate.

The piXserve Solution

piXserve is a general-purpose image/video search and alerting solution. Breakthrough technology developed by piXlogic allows the software to automatically “see” the contents of an image/video frame and create a searchable index so that users can search and create alerts in a very natural and logical way.

In a single, enterprise class software package piXserve bundles image and video search, face recognition, text recognition, automated tagging, and many other features specifically designed to help users make the most of the images and videos that they work with.

The piXserve text recognition technology is unique in a number of critical ways:

1. piXserve can detect the presence of text anywhere in the field of view of the image. This means that cameras don't need to be specifically positioned so that the car/license plate always appear at the same location on the image.

2. piXserve does not use traditional optical character recognition approaches, and does not require training for specific fonts or character types. This means that the piXserve software works with many different types of license plates: height and width of the license plate, color, background design, font type, layout type, etc.

3. piXserve understands that the image may contain uncertain information (illegible characters, obstructions, etc.) and deals with this uncertainty intrinsically. This means that users can search and retrieve useful results also in cases when only some of the characters are known. Partial string searches and use of search strings where some of the characters are missing or incorrect (ex: was it a number 0 or was it the letter O) are permitted in piXserve.

4. piXserve can recognize text in a multitude of languages. In addition
to latin character based languages (English, French, Italian, etc.) piXserve can also see and recognize ideogram based characters and double-byte characters (Japanese, Chinese, Korean, etc.). This means that piXserve provides flexibility to the multinational enterprise and a single system can accommodate a broad range of situations.

5. piXserve works with images and videos in a multitude of formats (over 90) as well as video streams transmitted over a range of protocols (RTP, RTSP, HTTP, etc.) over the network. piXserve does not require the use of specialized cameras. The higher the quality of the camera, the higher the accuracy that can be achieved. Any general purpose video surveillance camera that can transmit video over the network and whose resolution is such that the text on the image is a minimum of about 10 pixels in height (20 pixels for non-latin character languages) suffices. piXserve can recognize text that is rotated up to about 20 degrees in any direction.

6. piXserve includes not only text recognition for license plate recognition purposes, but also it's full suite of features. This greatly expands the value of the software as it gives users the ability to create search queries/alerts that comprise multiple elements. Some example situations are:

-- I am looking for a blue sedan with a license plate number where the first, second, and last character are V12.....9. The user can type the search characters, and either use a picture of a blue sedan or just type in "blue" (which happens to be color notion in the software) to filter the results.

-- I have a picture of this person. Did he fill gas today at any of my stations, and if so what was the license plate number of that car and where else has that car been seen. The user submits the picture of the person, gets a list of results, plays the video of the result, freezes the video playback and uses that frame to search for other instances of that car or types the license plate number in to search on that.

-- I am looking for a van of my local electric utility company "Pacific Gas and Electric". I know that their vans have a logo printed on the side. The user types the string "Pacific" and gets a list of video sequences where the word appeared. From the information returned he can see the feed (camera location) and time where this was seen. From the playback he can see the license plate.
number. With the license plate number he can search and retrieve all other instances of where this particular van has been over the past week.

7. piXserve-ALERT lets users create alert criteria just as one would formulate a search query. These criteria can be saved, managed, and shared. piXserve-ALERT keeps track of what piXserve machines on the network are indexing and when a match is made consistent with what the user specified, it generates a signal. The user receives an e-mail with a link to the alert results. A JMS (Java Messaging Service) signal is also generated to pass the alert on to other systems and applications for further action.

The piXserve search environment is intuitive and productive, and the user interface is through a web browser (Internet Explorer, Mozilla Firefox, Safari, Google Chrome, or equivalent). Users can drag-and-drop a picture from anywhere to formulate a similarity search query, or pause a video while it’s playing, and use that frame to create a new search criteria or refine an existing one. This latter capability greatly simplifies the discovery process precisely in those situations when the user isn’t quite sure what they are looking for and are working in an investigative/exploratory mode.

Summary

piXserve is a general purpose image and video search software package that provides the ability to search for license plates without requiring specialized cameras and equipment. piXserve is able to deal with a broad range of license plate types in multiple languages. No special training/customization is required.

piXserve provides an unparalleled level of image analysis and understanding. In a single tool it provides capabilities that span: object detection and recognition, face recognition, license plate recognition, text recognition, automatic tagging, and more. In each of these areas, piXserve redefines the state of the art.

For organizations that are interested in automatic license plate recognition, piXserve offers a more complete and therefore more valuable solution. The advantages over more specialized products are a higher return on investment, greater simplicity, and better operational effectiveness.

About piXlogic

piXlogic is a privately held company located in Los Altos, CA, USA, the heart of Silicon Valley. piXlogic is an In-Q-Tel portfolio company (a venture capital organization that
serves the needs of the US Intelligence Community. The company’s flagship products are piXserve and piXserve-ALERT. The software enables:

- Content Discovery (find pictures/videos that contain specific objects, scenes, text, or people of interest)
- Content Auto-tagging (automatically label an image/video)
- Content Alerting (automatically inform users when items of interest appear in a live video stream or web crawl)
- Content Change Detection (automatically compare images and video segments to detect changes at the object level)

piXlogic serves the needs of government and industrial customers. piXlogic sells its products directly and through a network of resellers in the US, the UK, Japan, Australia, Argentina, Israel, and Italy.

piXlogic, Inc. T. +1-650-967-4067
4984 El Camino Real F. +1-650-941-0992
Suite 102 E. info@piXlogic.com
Los Altos, CA 94022 W. www.piXlogic.com